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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Re: Computer III Further Remand Proceeding -- CC Docket No. 95-20

Dear Mr. Caton:

On behalf of CompuServe Incorporated, the Information Technology Association of America, and MCI Telecommunications Corporation, we are filing a report prepared by Hatfield Associates, Inc. entitled "ONA: A Promise Not Realized -- Reprise" for inclusion in the record of the Computer III Further Remand Proceeding.

If you have any questions, please contact the undersigned.

Sincerely,



Jeffrey A. Campbell

Enclosure

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**ONA:
A PROMISE NOT REALIZED -- REPRISE**

HATFIELD ASSOCIATES, INC.

APRIL 6, 1995

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ONA: A PROMISE NOT REALIZED -- REPRISE

The basic question the Commission is asking in this proceeding is whether changes in technology and markets since the original Computer III decisions justify structural relief for the RBOCs even though fundamental network unbundling has not taken place. This paper examines this issue and reaches the following major conclusions:

- The public interest in fundamental network unbundling has increased in recent years. The primary beneficiaries identified at the time of the Computer III decision, the Enhanced Service Providers (ESPs), would still benefit from true unbundling. In addition, the availability of unbundled network components has taken on a greatly increased significance as a prerequisite for a true market test of the proposition that local telephone competition can develop.
- The original vision for Open Network Architecture (ONA) has not been achieved. Granting RBOCs relief when they have not even complied with their original unbundling promises/obligations creates exactly the wrong incentives for further unbundling in the future.
- There have been significant technological changes in local networks since Computer III. As a consequence, full unbundling is both more feasible and more important.
- The RBOCs have ample opportunities to engage in discriminatory and anti-competitive practices against their potential competitors. These arise from the technological changes that are taking place.
- Other regulatory safeguards are useful, but will not prevent abuses. None of them -- incentive regulation, cross-subsidy and accounting rules, price caps, or the tariff review process -- has sufficient teeth, particularly in the face of inadequate Commission resources. This further heightens the importance of effective local exchange competition and the unbundling on which that competition will rely.
- Competition in the enhanced services market does not reduce the need for further unbundling or reduce the need for other safeguards.
- Based on the foregoing, a cost/benefit analysis demonstrates that the Commission should not grant the RBOCs any relief from structural separation requirements. Further relief will not help to achieve the goals of healthy, dynamic basic and enhanced services markets.

I. THE PUBLIC INTEREST IN FUNDAMENTAL NETWORK UNBUNDLING HAS INCREASED IN RECENT YEARS

Computer III was originally intended for the benefit of the ESPs. At the time of the original decision in 1986,¹ local telephone competition was barely a dream. As will be discussed in Section VI, the ESPs have no less a need for unbundled services today than they did in 1986. But an equally important application of unbundled network elements today is to support local exchange competition. Local competition is still far from a reality. But changing technology has at least increased the prospects for the development of competition. If competition is to become a reality, potential competitors require the availability of, and access to, unbundled components of RBOC networks.

A. Local Exchange Competition Requires Unbundling

Potential RBOC competitors include Competitive Access Providers (CAPs), cable companies, Personal Communications Services (PCS) providers, and electric utility companies. None of these classes of potential competitors possess all the components of a telephone network. CAPs can use their fiber rings in some instances for both distribution and interoffice facilities, but they have very little switching or signaling network capabilities. Nor are their transmission facilities by any means ubiquitous. Rather, only a limited number of customers are proximate to the CAP rings, so CAPs would benefit greatly from the ability to utilize unbundled local loops to extend their reach much further from their rings.

¹ Amendment of Section 64.702 of The Commission's Rules and Regulations (Computer III) Report and Order, CC Docket No. 85-229, 104 FCC 2d 958 (1986).

Cable companies and electrical utilities may be able to provide alternative distribution facilities -- that is, the portion of the network between their customers' premises and the equivalent of the central office -- but might not possess either interoffice transmission or switching. PCS providers reach the premises over the airwaves, but the limited range of a given radio site requires those sites to be distributed throughout the service area. Thus the provider may require backhaul facilities between its radio sites and a central location; it may also require switching and interoffice transmission.

Thus, the various "holes" in the facilities of each potential provider may be filled by the unbundled network elements of local exchange providers. To the extent that RBOC networks possess capabilities that are essential to competition, and those capabilities can be provided on a separate, or unbundled, basis, RBOCs should be required to make such unbundled elements available to potential local exchange service providers. What is more, they will benefit from the increased network usage that will result from others' use of the network elements. RBOC plans for future technology deployment should take into account the need for, and beneficial effects of, network unbundling. Thus the definition and implementation of unbundling is not a "static" exercise, but a "dynamic" one, to be regularly monitored by the Commission to insure compliance with the spirit and letter of the unbundling concept. Third parties should not be required to initiate action by the Commission, as happened in the case of the Advanced Intelligent Network (AIN) proceeding discussed below.

Another aspect of the dynamic nature of unbundling is that it should be responsive to the evolving needs of the marketplace. Thus, for instance, inasmuch as a PCS provider's need for backhaul facilities can be satisfied by the purchase of only the feeder, or loop carrier, portion of

the telephone company outside plant, it should be able to purchase just that component of the network, barring any technical or financial reason why it may not be feasible for RBOCs to provide that component.

B. There Is Little or No Local Competition Today

If past Commission proceedings are a reliable guide, the RBOCs will argue that local exchange competition is already well-developed. They will conclude that, as a consequence, the ESPs are no longer dependent on the RBOCs for access to their customers, so it is not necessary to impose ONA requirements on the RBOCs. The truth, however, is quite different. There is, in reality, virtually no local telephone competition today and it will be many years before significant competition does emerge. Nationwide, competitors have captured less than two percent of the exchange access business and a much smaller percentage of the local exchange business.²

The RBOCs sometimes rely on mere recitation of newspaper headlines or trade press articles describing the plans or intentions of potential entrants.³ While these media reports are certainly evidence that there is a great deal of interest in local exchange competition, the facts

² The discussion in the following paragraphs focuses on the structure of the local telephone market. Analysis of conduct and performance in the market also demonstrates the lack of competition. See Declaration of Daniel Kelley (Kelley Declaration), MCI's Initial Comments to the Department of Justice Concerning Motion to Vacate the Judgment, U.S. v. Western Electric, Civil Action No. 82-0192 (D.D.C.), December 4, 1994 (MCI Comments to DOJ), Exhibit 4.

³ See Affidavits of Jeffrey M. Perloff and Larry S. Karp, pp. 29-43, and Oliver E. Williamson, pp. 7-8, Motion of Four RBOCs to Vacate the Decree, U.S. v. Western Electric, Civil Action No. 82-0192 (HHG), July 6, 1994 (Motion of Four RBOCs), Appendices 30 and 44 respectively.

show that there is little actual investment, and even less actual competition. The press accounts can just as easily be taken as evidence that local exchange markets are not performing competitively today. If local markets were performing competitively, there would be less interest on the part of potential entrants.

That there is virtually no local exchange service competition anywhere in the U.S. today is easy to demonstrate. When a family or business moves into a new locality, or moves within the locality, it must contact the local monopoly RBOC to obtain telephone service. Even if a consumer could order a telephone line from a company other than the incumbent monopolist, the competitor could not duplicate the incumbent's service.

An essential characteristic of local telephone service is the ability to reach, and be reached by, many other individuals and businesses in the community. Only the incumbent has this existing network of customers. The incumbent would either originate or terminate most of the calls, leaving the entrant dependent on physical interconnection with the incumbent, as well as on the terms and conditions for this interconnection.⁴ In other words, even if competitors gradually increase market share as systems are built and customers are converted, for the foreseeable future, most calls placed on the new networks would have to be jointly supplied by the new entrant and the incumbent. As a result, since the original ONA decision, network interconnection has emerged as an important new form of access to RBOC networks.

In most states, the feasibility of local exchange competition is an academic question. Local exchange competition is simply not allowed. Even where allowed, it has barely started.

⁴ See Declaration of Nina Cornell, MCI Comments to DOJ (Cornell Declaration), Exhibit 1, at pp 6-8.

Only a handful of states both allow full local exchange competition and have certificated entrants.⁵ There are regulatory barriers to local competition even in these states. For example, in Illinois MCIMetro must go through a hearing process to obtain approval to provide service. Ameritech has filed to consolidate the MCIMetro case with its application to provide interLATA service. In Maryland, Southwestern Bell Corporation Media Ventures (SBC-MV) has applied for local authority. Bell Atlantic is questioning the technical competence of SBC-MV to deliver high quality telephone service over its cable facilities.⁶ As discussed further below, in addition to legal and regulatory barriers to entry, there are significant technical and economic barriers.

There are some experiments or market trials involving cable or wireless companies attempting to learn about local distribution technologies and markets. But these are as advertised -- limited experiments. Even where these experiments are ongoing, they are confined to small geographic areas and quite small numbers of households.⁷ These experiments do not represent competition. They are designed to test whether local competition is feasible -- and the results are not in.

There is a small amount of actual exchange access competition today. In particular, the Competitive Access Providers (CAPs) have constructed fiber rings in a number of cities. These

⁵ See NARUC, Report on the Status of Competition in Intrastate Telecommunications, September 23, 1994, Table 7, and individual state summaries.

⁶ See Testimony of Donald E. Albert, Case No. 8659, October 26, 1994, pp. 3-5.

⁷ For example, Teleport, TCI and Motorola recently announced a six-month test of the feasibility of delivering telephone services over a cable network. The system will be tested in 25 homes. See "Teleport to Conduct Local Service Trial with TCI, Motorola; Annunziata Reports Collapse of Talks with Time Warner," Telecommunications Reports, October 17, 1994, p.3.

fiber rings typically connect selected buildings in the central business districts of larger cities with the POPs of IXC's. The numbers show that the CAPs are an inconsequential factor in the nationwide access business. Table 1 shows an estimate of the current market presence of the CAPs of less than one percent of the total access market. IXC's report that less than one percent of their access payments go to CAPs.⁸ Data provided to us by AT&T (discussed below) and MCI show that customer-supplied access (by CAPs or otherwise) is also trivial.

Table 1⁹
1993 CAP v. LEC Access Revenues
(all revenue figures are in millions of dollars)

	<u>LEC</u>	<u>CAP</u>	<u>CAP SHARE</u>
Special Access	3,699	117	3.10%
Switched Access	17,178	32	0.20%
Total Access	20,878	149	.71%

Source: Connecticut Research, Local Telecommunications Competition, 1994, p. II-15, FCC, Preliminary 1993 Common Carrier Statistics and Hatfield Associates estimates. End user revenues were excluded from the LEC totals.

The existing nation-wide presence of the CAPs is obviously minuscule. But as noted earlier, access markets are inherently local. The RBOCs have argued that CAPs have attained a

⁸ See Economics and Technology, Inc. and Hatfield Associates, Inc., The Enduring Local Bottleneck, 1994, p. 2. ("ETI/HAI study").

⁹ State access revenues were distributed to the special and switched categories in the same proportion as interstate. Connecticut Research data overstate CAP revenues by including non-access services such as diverse routing for IXC POP-to-POP connections and for Centrex service. Elsewhere, Connecticut Research provided data that show that 45 percent of CAP access revenues are for IXC POP-to-POP circuits. This percentage was used to adjust the aggregate 1993 data. See "Access Revenue by Application," Connecticut Research Report on Competitive Telecommunications, January 1, 1994, p.52.

major presence in some of the largest metropolitan areas such as New York City and Chicago.¹⁰ Hatfield Associates recently performed an analysis of the Chicago access market, allegedly one of the most competitive in the U.S.¹¹ That analysis shows that the incumbent firm, Ameritech, remains the overwhelmingly dominant supplier of exchange access.

In sum, the local exchange service market is not competitive. Exchange access market competition is limited to portions of a few metropolitan areas, and is dwarfed by local exchange carriers even in these geographic markets. Technological change is enhancing the prospects for local competition. However, the development of that competition is highly uncertain. Even under optimistic assumptions, it will take at least several years to produce meaningful competition. In the meantime, the RBOCs will retain substantial market power.

CAP fiber ring expansions, telephony over cable television systems, wireless, telephony over electrical power systems, and satellite service are all potential competitors that may someday bring competition to local markets. All of these potential competitors will have to make substantial investments in sunk capital over a period of many years to become viable alternatives to the incumbent RBOCs. The potential for this competition to develop is not sufficient to prevent RBOCs from using their existing market power to discriminate against ESPs or other companies dependent on access to local telephone networks.¹² Unbundled network

¹⁰ See, for example, Affidavit of William H. Davidson, Motion of Four RBOCs, Appendix 9, p. 7, footnote omitted.

¹¹ See Testimony of Robert A. Mercer on Behalf of AT&T Communications of Illinois, Inc., Illinois Commerce Commission, Docket No. 94-0048, August 8, 1994.

¹² See ETI/HAI study. Portions of this work were updated for testimony in the Illinois Ameritech First proceeding. See the Testimony of Robert Mercer, *op. cit.*

elements are still critical, both to the ESPs, in order that they may provide their services in fair competition with the RBOCs, and to potential competitive providers of basic local exchange service.

II. THE ORIGINAL VISION FOR OPEN NETWORK ARCHITECTURE HAS NOT BEEN ACHIEVED

In light of the critical importance of ONA, and the unbundling of network elements it should provide, the fate of ONA has been unfortunate. The Commission has already conceded defeat in its efforts to induce RBOCs to undertake the fundamental unbundling of their networks they promised in the Computer III proceeding, and upon which the Commission relied in granting structural relief. The Commission now asks whether the unbundling that has been undertaken is sufficient to merit relief. The answer is no. The Common ONA Model upon which all of the ONA unbundling undertaken thus far is fundamentally flawed. Even within the scope of this flawed model, little has been achieved. Unbundling undertaken outside of the scope of the original ONA is marginally useful to ESPs, but is insufficient to justify structural relief.

A. The Common ONA Model Is Fundamentally Flawed

On the surface, a common approach to ONA by the RBOCs might appear to have been a desirable goal, in order to attain an appropriate degree of national uniformity. Unfortunately, under the Common ONA Model and the Basic Serving Arrangement (BSA) approach it spawned, the RBOCs attempted to ensure that their limited view of ONA prevailed -- that local exchange networks would not be meaningfully unbundled at all, so competitors would not have

access to the basic parts of the local exchange networks and the services they provide on an unbundled basis.

Most parties to the Computer III proceeding thought that there was a fairly unambiguous notion of ONA, consistent with the Commission's own intent. In its Report and Order in Computer III, dated June 16, 1986, the Commission defined ONA as follows:

...we consider Open Network Architecture to be the overall design of a carrier's basic network facilities and services to permit all users of the basic network, including the enhanced service operations of the carrier and its competitors, to interconnect to specific basic network functions and interfaces on an unbundled and 'equal access' basis. A carrier providing enhanced services through Open Network Architecture must unbundle key components of its basic services and offer them to the public under tariff ... These components ... may utilize sub-components that themselves are offered on an unbundled basis ... Such unbundling will ensure that competitors of the carrier's enhanced service operations can develop enhanced services that utilize the carrier's network on an economical basis.¹³

In other words, the basic components of the network -- the loop, switching, signaling, intelligent network services, interoffice transport -- and even appropriately-defined subcomponents of these components, such as the distribution and feeder portion of the loop -- would be available on a separate, or "unbundled," basis. A user could buy just those components it needed to construct the services it wished to offer. Thus, for instance, an ESP could purchase just the local loop from the RBOC, and connect it to its own facilities. The basic unbundled components of the network were referred to by the Commission as Basic Service Elements (BSEs).

The RBOCs chose to interpret the Commission's definition quite differently. They developed the Common ONA Model, in which the basic services of the network had to be

¹³ Computer III, at para. 113, emphasis added.

purchased first by a user, and then only some unbundled software features of those services would be available separately. The basic services were called Basic Serving Arrangements (BSAs), while the unbundled features were, according to the RBOCs, the BSEs. Thus the ESP and other competitors of the RBOCs were forced to purchase highly-bundled services, which completely undid the intent of ONA. In fact, many of the features put forward as the BSEs were already under development by the RBOCs prior to the onset of ONA.

Only because the Commission later ordered the RBOCs to explore with the industry how further unbundling might take place did they initiate an industry activity, the Unbundling Forum of the Information Industry Liaison Committee (IILC). Almost nine years later, the work of this unbundling forum has still not come to fruition. When Ameritech found it to be in its self-interest to offer a degree of unbundling (still short of full unbundling), Ameritech did so, but only conditioned on interexchange authority.¹⁴ Meanwhile, the other RBOCs continue to drag out the IILC process, claim network unbundling is so difficult to define as to render it impossible, and generally oppose the fundamental notion of such unbundling.¹⁵

B. Most Requests for ONA Basic Service Elements Have Not Been Met

After developing their own self-serving ONA model that was fundamentally at odds with the intent of the Commission's ONA construct, the RBOCs have been notably slow in

¹⁴ Ameritech Petition for Declaratory Ruling and Related Waivers, Public Notice DA 93-481, released April 27, 1993 (Ameritech Customer First Plan).

¹⁵ Necessary steps in the further unbundling of the network are discussed in Hatfield Associates, Inc., "New Local Exchange Technology: Preserving the Bottleneck or Providing Competitive Alternatives," April 6, 1992 (ONI Report).

implementing even that model. The July 1994, ONA Services User Guide,¹⁶ published by the RBOCs, shows the status of their ONA offerings compared to the requests of the ESP industry. At an early stage of the proceedings, ESPs and other users identified 118 ONA elements in which they were interested.¹⁷ These were boiled down by the RBOCs into 102 separate ONA services. Of these 102 services, only 19 have been fully deployed by all seven RBOCs. By contrast, 24 of the services have been deployed by three or less of the seven RBOCs in any part of their respective regions, and of these 24, six have not been deployed by any of the RBOCs. But the story is actually worse than that. Of the 118 original requests, 26 were, and still are, classified as requests for "a service that requires development" and dismissed by the RBOCs from further consideration by the wave of a hand. These are dismal implementation statistics, counter to the rosy view of the Commission that ONA is working well and that ESPs can now select from a wide variety of ONA offerings.¹⁸

C. RBOC Pricing Makes ONA Services Uneconomic

Making interfaces physically available is not enough to ensure that they will be useful to RBOC customers. As noted above, customers desiring access to BSEs must first purchase a BSA. Compared to local business lines, BSAs are very expensive, making it impractical for ESPs to purchase BSEs. For example, in Portland, Oregon, the rate for a single full time,

¹⁶ Bell Operating Companies, "Service Description, ONA Services User Guide," July 31, 1994.

¹⁷ ESPs submitted 118 requests on a national basis. They made additional requests to individual RBOCs. Only the national requests are considered here.

¹⁸ See In the Matter of Computer III Further Remand Proceeding, Notice of Proposed Rulemaking (Further Remand NPRM) at para. 20.

business line is \$35.17 per month; that is a flat rate charge with no usage charges. However, the cost of a FG-A line, a Category 1, Type A - Circuit Switched Line BSA,¹⁹ is \$50 per month, plus \$.03 per minute of use. For an ESP who wants to maximize the monthly minutes of use on each of his or her circuits, there is a vast difference in these two services.

If the ESP is able to keep a circuit loaded with 6,000 minutes of traffic per month, the charges for the BSA will be \$230 (\$50 recurring plus 6,000 minutes times \$.03 per minute), an increase of 554 percent over the cost of a business line. In return for paying almost \$200 more per line for a BSA, the ESP may purchase BSEs not available with a business line. The cost differential is so great, however, that the vast majority of ESPs continue to purchase business lines and have foregone the use of BSEs that might give them the capability to provide new and innovative services for their subscribers.

D. The Mediated Access "Solution" to Advanced Intelligent Network (AIN) Access Is Inadequate

The Commission cites its proposals in the AIN NPRM²⁰ as another change that justifies eliminating structural separation without requiring full network unbundling.²¹ Some background is needed in order to understand this assertion.

In December of 1991, the Commission launched an inquiry into the Advanced Intelligent Network (AIN) plans of the RBOCs. The AIN plan has been developed by Bell

¹⁹ ONA Services User Guide, *op. cit.*, p. 2.

²⁰ See, In the Matter of Intelligent Networks, Notice of Proposed Rulemaking (AIN NPRM), CC Docket 91-346, 8 FCC Rcd. G813 (1993).

²¹ See, Further Remand NPRM, at para. 31.

The Commission launched the AIN inquiry in response to concerns expressed by various parties that Bellcore, and the RBOCs, were developing AIN as a closed system that provided no one but the RBOCs themselves access to the programming capabilities inherent in AIN. Thus, it was claimed, the RBOCs were planning to introduce a new network technology, which had a high potential for providing new ONA capabilities to users, in a way that did not in fact advance the cause of ONA, because it did not allow third party access to AIN. Instead of being able to define their own services and service features, users would at most have the opportunity to input service-specific parameters into services defined and implemented solely by the RBOCs.

The proceeding led to an NPRM released by the Commission in August 1993. In the NPRM, the Commission proposed to open the programming capabilities of AIN to users in a series of steps, but with access only being provided through a form of "mediated access." Mediated access means the RBOCs have a degree of control over the services implemented by third parties, and hence the innovations those parties bring to the marketplace. Depending on the kind of mediation utilized,²³ this control may be so thorough as to mean the third party cannot develop any services at all, but may merely set parameters in the services the RBOCs are offering.

In the best case, mediation implies the RBOCs will investigate and test the third party services, and will therefore be able to 1) block the implementation of services for anti-competitive reasons, while hiding behind the mantra of "network harms;" and 2) through the investigation and testing they are allowed to do, gain a great deal of intelligence as to the service

²³ The NPRM proposes three kinds of mediation, which are implemented in stages over the next several years.

plans of RBOC competitors. In the worst case, the users will never be able to develop their own service capabilities, but will be limited only to using RBOC-defined services.

More than a year and a half has elapsed since the August, 1993, release of the Commission's NPRM in the proceeding. For the most part, the RBOCs have opposed third party access to IN, and are thus fighting mediated access. As a consequence, no progress has been made during this time. This is unfortunate, for mediated access, not a very satisfactory idea in the first place, becomes more onerous the longer it is delayed. The industry seems to have arrived at the situation in which the RBOCs oppose mediated access to the AIN in any form because of their opposition to third party access, while ESPs and other network providers oppose it because it is not a very satisfactory way to access IN. In this situation, it is certainly not reasonable for the Commission to cite the NPRM as reason for reconsidering structural separation.

E. Unbundling Undertaken Outside of the Scope of the Original ONA Is Marginally Useful to ESPs, but Is Insufficient to Justify Structural Relief

The Commission cites the unbundling that has taken place as a result of the Expanded Interconnection Docket as another factor that might obviate the need for the fundamental unbundling promised by ONA. While transport unbundling is undoubtedly beneficial to the CAPs, it does little for enhanced service providers. As discussed below in Section III, access to the intelligence of the network and higher speed access to end-user customers will provide substantial benefits to ESPs. Transport unbundling provides no new network features and functions that were not available to ESPs from the RBOCs in the first place. Transport unbundling is most useful to customers that purchase carrier access. Most ESPs do not purchase

Feature Group access, because as we have shown previously, the high costs of such access discourage its use.

In terms of unbundling the transmission portions of the local network, much remains to be done even after the Transport unbundling decisions. As discussed above, local competitors require access to the loops and separate access to interfaces within the loop plant of the RBOCs.²⁴ While this further unbundling will not, by itself, provide a great deal of functionality for ESPs, it will further the prospects for local competition, which will provide ESPs with alternatives to the monopoly RBOCs on which they now are forced to rely.

III. THERE HAVE BEEN SIGNIFICANT TECHNOLOGICAL CHANGES IN LOCAL NETWORKS SINCE COMPUTER III

The original premise of Computer III was that development of sophisticated network technologies would allow fundamental network unbundling and thereby limit the ability of RBOCs to discriminate against competitors. The new technologies that were supposed to allow unbundling are indeed being implemented. However, access to the capabilities made possible by these technologies is not being made available to competitors.

Implementation of these new technologies without fundamental network unbundling increases the competitive advantages conferred on RBOCs by virtue of their control over the local exchange bottleneck. As explained below, these technological trends have made it even more difficult for regulators to detect and remedy any RBOC abuse of their monopoly power over the intelligent, central nervous system of the local network. As a consequence, relief from

²⁴ ONI Report, op. cit. See also, Hatfield Associates, Inc., Open Network Architecture: A Promise Not Realized (April 1988).

the structural separation requirements or any other safeguards imposed on the RBOCs would be inappropriate. If anything, the Commission should consider more stringent requirements.

A. New Network Capabilities

In the following sections, new local telephone technologies and the applications they support are described. The implications for interconnection and unbundling policies are explained in the next section. The most significant technological developments of potential interest to ESPs are new signaling systems, the Advanced Intelligent Network, and the deployment of the Integrated Services Digital Network (ISDN).

1. New Signaling Systems

In addition to conveying the customer's actual telephone message or conversation, a telephone network must also convey other information associated with setting up, disconnecting, and otherwise controlling the call. The transmission and reception of such control information between the customer and the network, or between elements (e.g., switches) within the network, is called signaling. Signaling is necessary for the establishment and control of connections through the network or collection of networks. Examples of signaling information include the number of the called party, the number of the calling party, and an indication that the called party has "gone off-hook" (answered the call). Such control information is needed, for example, to route the call and to properly bill for it. An enhanced service provider could use such information to, for instance, determine the identity of a calling party, and thereby call up database information specific to that party, or to be able to store a message in the right voice mailbox.

At the time that Computer III was decided, most signaling in RBOC networks was still carried "in-band," i.e., within the same channel or path that carried the telephone conversation or message. Today, as Table 2 shows, the RBOCs have widely deployed common channel signaling.

Table 2

RBOC SS7 Deployment
(thousand lines)

1986	0
1993	92,439

Source: ARMIS Report 43-07

With common channel signaling, signaling information is exchanged via a data network (actually a specialized packet-switched network) that is separate from the conversation path. Common channel signaling ("CCS") and the Signaling System 7 ("SS7") protocol have become a crucial component of not only ordinary calling, but also of current and future network-based services. Current SS7-based offerings include Calling Card, 800-Number Portability, and CLASSSM services.²⁵ The latter include automatic callback, automatic recall, calling number/name identification, selective call acceptance/rejection, distinctive ringing, customer control over the time of call origination, and several others.²⁶ Only a limited number of these features have been made fully available to competitors under ONA plans.

²⁵ CLASS was originally an acronym for the term Custom Local Area Signaling Services. It is now used as a servicemark for a collection of telephone company provided services.

²⁶ Bellcore, "BOC Notes on the LEC Network 1994", Special Report SR-TSV-002275, April 2, 1994, pp. 14-13 thru. 14-19.

2. Intelligent Networks

RBOC switches can also use the SS7 networks to access a remote computing system (e.g., a computer processor and associated data base residing in the network) during the processing of a particular call when some predesignated condition is encountered. The remote computing system can be used, for example, to have the call routed differently depending upon the calling or called number, the time-of-day, additional information requested from the person placing the call, or conditions in the network. For example, all calls to a single telephone number assigned to a particular pizza restaurant chain could be routed to the nearest outlet of the chain based upon the number of the calling customer. A network such as this is generally referred to as an "intelligent network," and these types of services as intelligent network services. Whether one would say there is more processing (that is, intelligence) or that the processing is simply more versatile and accessible, is a moot point.

Intelligent networks are already having a positive effect on users. For example, at one time it was difficult for telephone companies to offer Centrex service on a metropolitan or area-wide basis. In other words, they had difficulty offering an integrated service to a customer who had multiple locations served by different end offices. This had the effect of putting them at a disadvantage compared to PBXs that provided a more integrated solution. With the advent of intelligent network capabilities, the RBOCs were able to offer city-wide Centrex, and this is one of the reasons that Centrex has been able to make "surprising inroads" into the PBX market, as described in a recent report by the North American Telecommunications Association.²⁷ The

²⁷ North American Telecommunications Association, 1993/1994 Telecommunications Market Review and Forecast, (Washington, D.C., 1993), p. 149.